

Leavenworth, Kansas: floating ice on the river, 6th to 11th, 22d to 24th, 27th, 28th; river frozen, 12th to 15th, 17th to 21st.

Miscellaneous.—Mr. Wm. G. Yetter, voluntary observer at Catawissa, Columbia county, Pennsylvania, reports that navigation on the north branch of the Pennsylvania canal was closed by ice on the 7th.

Mr. Geo. S. Truman, voluntary observer at Genoa, Nance county, Nebraska, reports that the unusually mild weather during the last half of December caused the ice to break up in the Loup and Platte Rivers; considerable damage was done to the bridges at Columbus, Platte county.

FLOODS.

California.—San Francisco: the heavy rainfall of the 21st caused considerable damage by flood; in some parts of the city the water was four feet deep; cellars in the business portion of the city were flooded, damaging the goods contained in them, and entailing a loss of several thousand dollars.

Delta, Shasta county: the railroad track was washed out at numerous places between Tunnel No. 5 and Delta on the 25th; the Sacramento River, and all streams, are unusually high.

Yreka, Siskiyou county: the streams overflowed in consequence of the heavy rains of the 24th and 25th.

Redding, Shasta county: the Sacramento River rose eighteen feet on the 24th, and was higher than at any time since 1880. Considerable damage was done along the line of the railroad in this vicinity.

Marysville, Yuba county: the Yuba River reached a height of fourteen feet on the 25th, the highest point reached this season; the Feather River was also correspondingly high.

West Virginia.—Grantsville, Calhoun county: a sudden rise in the West Fork, a tributary of the Little Kanawha River, on the 29th, caused a great amount of damage; the Pennsylvania Lumber Company lost two saw-mills and \$10,000 worth of lumber.

HIGH TIDES.

Norfolk, Virginia: an unusually high tide occurred on the morning of the 2d, flooding the lower part of the city.

Indianola, Texas: a very high tide occurred on the 12th; the flats and lower part of the town were submerged.

Cohasset, Norfolk county, Massachusetts: an unusually high tide occurred on the 26th; much damage was done to property along the shore.

Nantasket, Norfolk county, Massachusetts: the water reached a higher point on the 26th than during the unusually high tides of November, 1885.

Sandwich, Barnstable county, Massachusetts: the highest tide ever known occurred on the 26th. Many streets were flooded to the depth of eight feet, doing much damage.

Very high tides occurred at Gloucester and Rockport, Essex county, Wellfleet, Barnstable county, Hingham, Plymouth county, Massachusetts, on the 26th, causing much damage along the coast.

Norfolk, Virginia: the highest tide since 1876 occurred on the 26th.

Cape Henry, Virginia: the highest tide in seven years occurred on the 26th.

Kitty Hawk, North Carolina: the tide of the 26th was the highest that has occurred in forty years; the sea-coast telegraph line was washed away in places, and much damage done to property in the vicinity of Oregon Inlet, North Carolina, where a dwelling house was carried off its foundation; a large number of cattle were also lost.

High tides were also reported, as follows:

Eastport, Maine, 24th to 27th.

Boston, Massachusetts, 26th.

New Haven, Connecticut, 14th.

Ocean City, Maryland, 26th.

Chincoteague, Virginia, 1st, 2d.

Fort Macon, North Carolina, 4th, 9th, 25th, 26th.

San Francisco, California, 21st.

LOW TIDES.

Chincoteague, Virginia, 20th, 21st.

Cedar Keys, Florida, 22d.

Indianola, Texas, 14th, 15th, 16th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for districts east of the Rocky Mountains during December, 1885, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 81.73 per cent. The percentages for the four elements are: Weather, 85.84; direction of the wind, 79.25; temperature, 77.22; barometer, 87.94 per cent. By geographical districts, they are: For New England, 82.40; middle Atlantic states, 85.17; south Atlantic states, 84.50; eastern Gulf states, 83.78; western Gulf states, 80.14; lower lake region, 80.32; upper lake region, 80.76; Ohio Valley and Tennessee, 81.88; upper Mississippi valley, 82.07; Missouri Valley, 75.98. There were six omissions to predict, out of 3,221, or 0.19 per cent. Of the 3,215 predictions that have been made, one hundred and twenty-six, or 3.92 per cent., are considered to have entirely failed; one hundred and forty-nine, or 4.63 per cent., were one-fourth verified; four hundred and sixty-nine, or 14.59 per cent., were one-half verified; four hundred and sixty, or 14.31 per cent., were three-fourths verified; 2,011, or 62.55 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

The percentages of indications verified for the Pacific coast districts, are as follows: General average, 75.71. By elements they are: For weather, 81.82; wind, 70.91; temperature, 74.39. By districts they are: North Pacific coast region, 70.46; middle Pacific coast region, 77.42; south Pacific coast region, 79.24 per cent.

The general average percentage of verifications for all districts is 80.93 per cent.

The percentages of verifications of special predictions for certain localities are, as follows:

Baltimore, Maryland, 90.35; Washington City, 83.33; Erie, Pennsylvania, 66.94; Boston, Massachusetts, 75.81; New Haven, Connecticut, 77.42; Portland, Maine, 75.81; Albany, New York, 78.23; Pittsburg, Pennsylvania, 64.92; Cincinnati, Ohio, 71.77; Louisville, Kentucky, 70.16; Columbus, Ohio, 75.81; Cleveland, Ohio, 65.32; Indianapolis, Indiana, 77.50; Oswego, New York, 78.63; Rochester, New York, 79.44; Buffalo, New York, 77.02; Milwaukee, Wisconsin, 74.59; Chicago, Illinois, 80.74; Detroit, Michigan, 72.98; Toledo, Ohio, 74.19; Sandusky, Ohio, 75.00; Cairo, Illinois, 77.02; Saint Louis, Missouri, 81.50; Memphis, Tennessee, 75.81; Shreveport, Louisiana, 75.81; Iowa, 72.54; Tennessee, 84.68; Florida (thirteen days), 90.38; Omaha, Nebraska (twenty-seven days), 86.11; Arkansas (twenty-seven days), 84.43; Georgia (twenty-seven days), 90.28; New York City (thirty days), 78.33; Philadelphia, Pennsylvania (thirty days), 81.67; Colorado, 68.95.

CAUTIONARY SIGNALS.

During December, 1885, one hundred and fifty-seven cautionary signals were ordered. Of these, one hundred and forty-six, or 92.99 per cent., were justified by winds of twenty-five miles or more per hour, at or within one hundred miles of the station. Seventy-three cautionary off-shore signals were ordered, of which number, fifty-nine, or 80.82 per cent., were fully justified, both as to direction and velocity; seventy-one, or 97.25 per cent., were justified as to direction; and sixty, or 82.19 per cent., were justified as to velocity. Two northwest signals were ordered, both of which were justified as to direction and velocity. Two hundred and thirty-two signals of all kinds were ordered, two hundred and seven, or 89.22 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, nineteen were changed from cautionary signals. Nine signals were

ordered late. In ninety-three cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

During the month there were one hundred and forty-nine cold-wave signals displayed. Of these, one hundred and thirty-nine, or 93.29 per cent., were justified.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for December, 1885, states:

The verifications of predictions for the whole area was 88 per cent. for temperature, and 100 per cent. for weather.

The following roads comprise this system: Western of Alabama; South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus Western; Alabama Great Southern; Atlanta and West Point of Georgia; Northeastern of Georgia; Atlanta and Charlotte Air Line; Western and Atlantic; Georgia; East Tennessee, Virginia and Georgia system in Georgia; and Savannah, Florida and Western.

ATMOSPHERIC ELECTRICITY.

AUORAS.

Auroral displays occurred during December, as follows:

Fort Totten, Dakota: an auroral arch of 25° altitude and 100° azimuth was observed at 9.20 p. m. of the 1st, the display lasting until 4.30 a. m. of the 2d.

Fort Sully, Dakota: a faint aurora, extending from 180° to 195° azimuth, with an altitude of 5°, was observed from 11.25 p. m. to midnight of the 1st.

Escanaba, Michigan: an auroral display was visible from 9.22 to 10.58 p. m. of the 1st, consisting of a dark segment of 15° altitude, bordered by a bright yellow arch 5° in width.

Mount Washington, New Hampshire: a faint auroral light was observed at 9.30 p. m. of the 1st; it gradually increased in extent until 10.10 p. m., when it reached its maximum of 40° azimuth with an altitude of 4°; streamers of a light green color were seen at intervals.

Bismarck, Dakota: an auroral light of a pale yellow color was observed at 10.45 p. m. of the 1st having an altitude of 5°, and extending from 135° to 225° azimuth; the arch was uniform and well defined; no dark segment was observed.

Manistique, Schoolcraft county, Michigan: a moderate auroral arch was observed from 8.30 to 10 p. m. of the 1st, having an altitude of 10° to 15° and extending from 170° to 215° azimuth.

Saint Vincent, Minnesota: an aurora was observed at 9.30 p. m. of the 1st, consisting of a pale, indistinct arch resting on a dark segment of 25° altitude, and extending from 160° to 250° azimuth.

Burlington, Chittenden county, Vermont: an aurora of a light straw color was observed from 12.30 to 1.30 a. m. of the 6th.

Portland, Maine: an aurora was observed from 9.40 to 11.45 p. m. of the 6th, consisting of an arch 5° in altitude and 85° azimuth; it faded away at 10.20 p. m., and reappeared a few moments later as an irregular arch, with two streamers, of about 30° altitude, having but a slight motion.

Cambridge, Middlesex county, Massachusetts: a low auroral arch, above a dark segment, was observed on the 6th.

Duluth, Minnesota: an auroral light, of a pale white color, having an altitude of 20° and extending from 160° to 230° azimuth, was observed at 8.30 p. m. of the 6th. At 9.45 p. m. the color changed to a light green.

Saint Paul, Minnesota: a faint auroral light, of a whitish color, was observed in the northern horizon on the 6th.

Saint Vincent, Minnesota: an aurora was observed at 7.20 p. m. of the 6th; it consisted of a pale whitish arch about 5° in width, and extending from 160° to 270° azimuth, with an altitude of 30°; the lower edge of the arch was well defined, beneath which a dark segment was plainly visible. The display continued until daylight of the 7th.

Tatoosh Island, Washington Territory: an aurora was observed from 2.15 to 4.00 a. m. of the 7th, consisting of a bluish-

white color of 5° altitude, with a few slender beams shooting up to an altitude of 15°; the arch was bounded on the east and west by dense stratus clouds.

Manistique, Schoolcraft county, Michigan: an aurora, having a moderate diffused light, was observed at 12.18 a. m. of the 8th, having an altitude varying from 8° to 22° and 160° to 220° azimuth. The display lasted until daylight.

Escanaba, Michigan: an aurora of a pale yellow color was observed at 9.19 p. m. of the 6th; the display was very faint, and disappeared at 11.49 p. m.

Prairie du Chien, Crawford county, Wisconsin: an aurora of a whitish color, low in the sky, and 9° east of the magnetic pole, was observed from 9 to 10 p. m. of the 6th.

Saint Vincent, Minnesota: a faint auroral light was observed in the north at 7.45 p. m. of the 7th, continuing until after midnight.

Fort Totten, Dakota: an auroral display was visible from 9 p. m. of the 8th to 3 a. m. of the 9th, consisting of two arches of 15° and 20°, reaching its maximum intensity at 2 a. m.

Saint Vincent, Minnesota: an aurora, consisting of two parallel arches about 3° apart, and extending from 150° to 260° azimuth, with an altitude of 20°, was observed at 8.15 p. m. of the 8th. The lower arch was well defined, while the upper one was somewhat indistinct. The display continued until the morning of the 9th.

Other auroral displays were observed during the month, as follows:

1st.—Mackinaw City and Traverse City, Michigan; Gardiner and Kent's Hill, Maine; Winnipeg, Manitoba; Sydney, Nova Scotia; Charlottetown, Prince Edward's Island.

2d.—Mackinaw City, Michigan; Winnipeg, Manitoba.

4th.—Winnipeg, Manitoba.

5th.—Embarras, Wisconsin.

6th.—Boston, Massachusetts; Escanaba, Michigan; Moorhead, Albert Lea, and Sherburne, Minnesota; Fort Benton, Montana; Webster and Fort Totten, Dakota; Bancroft, West Union, and Cresco, Iowa; Gardiner, Cornish, and Kent's Hill, Maine; Nashua, New Hampshire; Embarras and Madison, Wisconsin; Winnipeg, Manitoba; Sydney, Nova Scotia; Charlottetown, Prince Edward Island.

7th.—Marquette, Michigan; Moorhead, Minnesota; Independence, Iowa; Gardiner, Kent's Hill, Cornish, and Orono, Maine; Cambridge, Westborough, and Fall River, Massachusetts; Newport, Vermont; Embarras, Wisconsin; Toronto, Ontario; Sydney, Nova Scotia.

8th.—Fort Totten and Webster, Dakota; Orono, Maine; Winnipeg, Manitoba.

9th.—Kent's Hill, Maine.

17th, 26th, 29th.—Winnipeg, Manitoba.

30th.—Lansing, Michigan.

THUNDER-STORMS.

Thunder-storms were reported in the various states and territories, as follows:

Alabama.—Mobile and Greensborough, 8th; Montgomery and Birmingham, 9th.

Arizona.—Fort Apache and Tucson, 8th; Fort Grant, 7th, 8th; Fort Bowie, 27th.

Arkansas.—Little Rock and Lead Hill, 8th.

Colorado.—Montrose, 31st.

Florida.—Archer, 2d, 9th, 13th, 26th; Sanford, 2d, 10th; Tallahassee, Jacksonville, and Cedar Keys, 9th; Key West, 9th, 14th; Pensacola, 13th.

Georgia.—Atlanta and Savannah, 9th.

Illinois.—Windsor, 4th, 8th; Cairo, Anna, Bunker Hill, and Collinsville, 8th; Chicago, 9th.

Indiana.—Greencastle, Indianapolis, and Terre Haute, 8th.

Louisiana.—Point Pleasant and Shreveport, 8th; Grand Coteau, 12th; New Orleans, 13th; Morgan City, 24th.

Massachusetts.—Fall River, 19th.

Mississippi.—Vicksburg, 8th, 9th.

Missouri.—Centreville, 9th.

New Mexico.—Santa Fé, 27th.